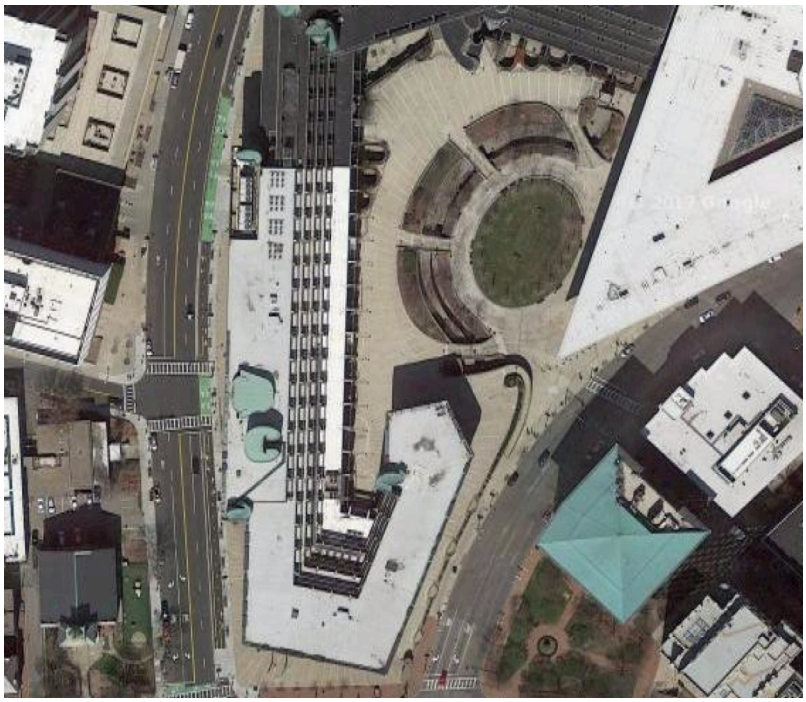
INDOOR AIR QUALITY ASSESSMENT

Department of Mental Health (DMH) Lindemann Building
Central Office Mezzanine
25 Staniford Street, Boston



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
July 2019

Background

Building:	Department of Mental Health (DMH) Lindemann Building, Central Office Mezzanine
Address:	25 Staniford Street, Boston
Assessment Requested by:	Sharon Moody, Assistant Director Engineering & Facilities Management DMH
Reason for Request:	Odor, Mold and Indoor Air Quality (IAQ) concerns
Dates of Assessment:	June 17, 2019 with return visit June 20, 2019
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Ruth Alfasso, Environmental Engineer, indoor air quality (IAQ) Program
Building Description:	The area assessed was the Mezzanine area of Erich Lindemann Mental Health Center, a Brutalist concrete building constructed in the 1960s.
Windows:	Not openable, some rooms have doors to the outside

Note that this building has been visited by the IAQ program several times in the past, and this particular section of the building was visited in October of 2018. The October 2018 report is attached as Appendix A.

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

The following is a summary of indoor air testing results taken on June 17, 2019 (Table 1). No additional measurements were taken on June 20, 2019.

- ***Carbon dioxide*** levels were below MDPH guideline of 800 parts per million (ppm) in all areas surveyed, indicating adequate air exchange. Note that the overall occupancy of this area is low.
- ***Temperature*** was within the recommended range of 70°F to 78°F in all areas tested.
- ***Relative humidity*** was within recommended range of 40 to 60% in the areas tested.
- ***Carbon monoxide*** levels were non-detectable (ND) in all indoor areas tested.
- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality (NAAQS) limit of 35 $\mu g/m^3$ in all areas tested.

Ventilation

A heating, ventilating and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally-occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals.

Fresh air is provided by air handling units (AHUs). Air from the AHUs is filtered, heated/cooled, and delivered to rooms via ducted supply vents. Air is returned/exhausted through vents around lights. Additional heating is provided by radiators along outside edges of the building. Each room should have a source of fresh air. In some cases it appeared that fresh air was supplied in hallways outside offices and drawn into each office through the action of the return or exhaust vent. This may contribute to the distribution of odors, as discussed in the sections below. It could also not be determined if restroom vents were connected to the general return system or to a direct vented exhaust system. Direct exhaust venting in restrooms and other areas that generate odors and moisture is important to avoid recirculating them to the rest of the building.

The assessment results indicate that the ventilation system is providing adequate fresh air for the current occupancy. It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). It is unknown when the last time this system was balanced. Note that when this building was built, the use/occupancy was

different, for example some current offices may have been patient or medical exam rooms. It is not known if ventilation was adjusted to take into account these changes.

Odor/Microbial/Moisture Concerns

The main reason for this visit was concerns about odors which were reported to be strongest in the area adjacent to an employee entrance, but had also been reported throughout the space. Odors in this building have been a frequent concern, and this visit was prompted by an increase in odors described as a foul organic odor ("musty"). On June 17, 2019, a musty odor was noticeable in some areas, including the employee entrance and the hallway, but was not strong enough to allow for a precise determination of source location. A return visit was made on June 20, 2019 when occupants reported a stronger odor. Odors were slightly more noticeable in the employee entrance area at that time.

No direct source of the odor was found during either visit, although several potential sources were eliminated. The odor was not associated with carpeting, furniture or other items in the employee entrance. While they were not a source of the odor during the visit, large amounts of ivy, mulch and other plants were found against the building (Picture 1). This can lead to odors and degrade the exterior surfaces of the building which will make water intrusion more likely over time. Items in the elevator lobby and hallway, including carpeting, were also examined and none appeared to be the source of the odor.

Based on the inability to identify a specific source of the odor and the nature of the odor, it is possible that the odor originates in the HVAC system. HVAC systems can accumulate odors on components such as heat transfer coils and filters. A condition referred to as "dirty sock syndrome" because of the odor produced can occur when debris or corrosion on HVAC chilling components builds up and leads to microbial growth and odors. Damaged or moistened filter media can be a source of odors. Odors from near fresh air intakes can also be drawn in and distributed to occupied areas.

It was not possible for IAQ staff to inspect the HVAC equipment at this site, but division of Capital Asset Management and Maintenance (DCAMM) engineering staff were able to examine the systems and nearby area following the June 20, 2019 visit. The DCAMM engineer reported they found penetrations through the concrete floor where the mezzanine level air

handler is located and reportedly sealed the penetrations. They expected that this would abate the odors.

Note that during both the recent visit and visits conducted in the past, numerous conditions were observed that may contribute to odors, microbial growth and other IAQ issues in this building. These include:

- A complex shape with crevices, skylights, oddly-shaped windows and other areas can allow leaks during wet weather. Some of the leaks noted during previous visits had been repaired.
- Moisture introduced into the building through leaks can moisten floors, items on floors such as carpeting, and can create humid conditions which can lead to condensation on other porous materials. Porous items chronically moistened are likely to become mold-colonized and may deteriorate releasing other odors.
- Water accumulation was reported to occur in restrooms on the mezzanine level during storms. This condition can chronically moisten building materials in the restrooms.
- There are a number of infrequently used restrooms inside offices. Drains in floors and fixtures that are not moistened can allow sewer gases into occupied areas. Unused fixtures can also leak without detection and lead to chronic water damage.

The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials (e.g., wallboard, carpeting) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Surfaces were examined for mold growth and nothing specific was identified as moldy, however due to the significant amount of water damage observed, it is likely that microbial growth has occurred or will occur on moistened porous materials.

Since leaks may occur during wet weather, items that are susceptible to water damage should be kept away from areas with known or likely leaks. Since the previous visit in October of 2018, this recommendation appeared to have been followed, particularly in the employee entrance area.

Because some rooms are currently not occupied on a regular basis, it is important to have a system to inspect, identify and report leaks and other problems even in areas not used daily so that drying can begin promptly.

Other IAQ Evaluations

During the previous visit, numerous plug-in type air fresheners were in use. Some of them were also in use during the current visit. As noted previously, these and other types of air fresheners introduce volatile organic compounds (VOCs) into the indoor environment. VOCs can be a source of irritation and allergic reactions in some people. Additionally, they only mask odors and do not remove the source.

Some vents were found to be dusty (Picture 2). Dust can be reaerosolized and cause irritation. It can also become a medium for mold growth if moistened due to leaks or high humidity.

Due to ongoing water issues, carpeting should be removed from any areas with known leaks. Remaining carpets and area rugs should be vacuumed regularly with a high efficiency particulate arrestance (HEPA)-filter-equipped vacuum cleaner and cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning and Restoration Certification (IICRC) recommendations, (IICRC, 2012).

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Continue to follow recommendations made in the October 2018 report (Appendix A).
2. Continue to keep a log of any odors, including time and location of occurrence, if they reoccur.
3. Monitor areas where leaks are known to occur for water infiltration during rain or snow events.
4. Ensure that carpeting that remains in the employee entrance lobby is odor free and cleaned frequently. Remove other porous materials in this area that show any signs of water damage or odors.

5. Trim back vines and plants from the building near the entranceway and remove mulch and accumulations of plant detritus.
6. Operate supply and exhaust ventilation continuously in all areas during occupied periods. Ensure all HVAC equipment is cleaned/maintained in accordance with manufacturer's instructions including filter changes.
7. Clean carpeting annually or more frequently per the recommendations of the Institute of Inspection, Cleaning and Restoration Certification (IICRC).
8. Clean dusty vents periodically to prevent reaerosolization or moistening.
9. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

IICRC. 2012. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: FAQ.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

US EPA. 2008. "Mold Remediation in Schools and Commercial Buildings". Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. September 2008. Available at: http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide.

Picture 1

Ivy covering walls outside employee entrance

Picture 2

Dusty vent in employee entrance area